- III - AMENDED CLAIMS UNDER 37 CFR 1.121

Reply to Claims Rejections - 35 usc § 112

14. Claim 15 is rejected under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention.

The Applicant regards as the invention the transformation of a concave circular membrane whose the arrow, or thikness, is very large, in a multy waves plane surface whose the thikness, the vertical crest to crest distance, is so little as one wants.

The thin object so made can be wound onto itself in a cylinder, as a paper disk, and easily transported.

There is not particular structural relation between the folded membranous mirror and the folded actuating mambrane.

These two membranes can be folded together, the membranes being in contact, or folded individually.

In the new claims, to avoid confusion, the membranes are folded individually.

The Applicant is very estonished by the difficulties introduced by the folding of concave membranes according to the invention.

This folding method is a very new method, but the Applicant thought that the specification and the drawings were sufficient.

To explane better, if possible, the Applicant adds a new drawing, that is an exemple and not new matter.

Endeed, the Applicant thinks that the best cut showing the limit of the waves is an narrow line, as large can be the mirror.

Claim rejection - 35 USC § 102

What are two independent things ?

The expression " independent membranes " is ambiguous.

Hutchinson thoroughly describes the peripheral connection between the metal membrane 22 and the reflective flexible membrane 26 via ring 16 and various accessories of sealing.

This peripheral material solidarisation of the two membranes is essential to ensure the sealing between wall 18 and membrane 26 so as to be able to create a depression ensuring the puting of the reflective membrane 26 against the metal membrane 22, thus constituting the parabolic mirror object of the invention.

Under these final conditions, achieving the goal of the invention, the two membranes are perfectly and firmly tied, without possibility of independent movements.

It cannot be said that the membranes are independent, and, in addition, Hutchinson does not describe nor does not assert the independence of the two membranes.

Now, if one considers with the Examiner the manufactures completely independent of the metal membrane 22 and the flexible membrane 26, it can be said that membranes 22 and 26 are independent.

Then, the Applicant does respectfully to observe that, in this meaning, in most cases, the handle and the blade of a knife would be independent devices.

So, what is the better : " Please, lend me your blade and your handle ", or " Please, lend me your knife " ?

To avoid, by lack of time, a certainly very interesting semantic and philosophic discussion about the word " independent ", the Applicant asks respecfully for reinstate the initial claim 1f, slighty amended.

In the mind of the Applicant, " independent " was the better to sum up that the membranous mirror and the actuating membrane were without contact, with semself or other device

With this claim 1f slighty amended and the substitute specification, all the objections of the Office Action Summary disappear, absolutly without new matter.

What is an actuating device ?

In the astronomical terminologiy, a device " actuating " a telescope mirror is a device which alters continuously the shape of a telescope mirror to give to it a perfect shape, under control of a chape controler.

Hutchinson, colum 3, lines 50 - 55 describes the constant puting of the reflective membrane 26 against the metallic membrane 22.

The metallic membrane 22 is not an actuating device, but an inert device.

The application being in the astronomic field, the Applicant respectfully point out it is basic to use the particular terminology of this matter.

The Applicant confesses humbly does not remember why he has amended on 11/04/99 the claim 1f and inserted the ambigous word " independent ".in amended claim 1.

Claims rejection - 35 USC § 103

The elements " memory shape ", " ring " and " independent " being out of the claims, **there is no more subject** for 35 USC § 103.

For the " ring ", the Applicant respecfully point out that the " ring " of the application was an temporary device for handling the membranes.

- III - Amended Claims under 37 CFR 1.121 (c)

1 (twice amended) - Telescope optical device comprising a mirror and a device actuating the mirror

characterized in that the mirror and the actuating device are free concave membranes without contact between them, or with an other device, and tied by their central parts to the telescope

45 (new) - Telescope optical device according to claim 1,

characterized in that there are two levels of control to give at the free membranous mirror a perfect shape :

In a first level, an aproximate shape is given to the free actuating membrane by interaction of a magnetic fiels tied to the telescope with magnetic fields generated by actuating membrane;

in a second level, a perfect form is given to the free membranous mirror by electrostatic interaction of the free actuating membrane with the free membranous mirror.

46 (new) - Telescope optical device according to claim 1,

characterized in that by use of the capacitive coupling between the conductive layer of the mirror and specific electrodes of the actuating membrane, the spread electronic integrated in the actuating membrane acts for the self-stabilisation of the shape of the system mirror--actuating membrane.

47 (new) - Telescope optical device according to claim 1,

characterized :

in that, for its folding, the concave membranous mirror is deformed by the formation of concentric circular ondulations obtained by a succession of centered distorsions alternately concave and convex, altering the pure concave surface of the membraneous mirror in a circular surface comprising a series of circular centered wawes whose the vertical crest to crest distance is so small as one wishes, in view of the number of waves so great as one wishes.

and in that the thin almost flat object so obtained is wound onto itself, forming a cylinder.

48 (new) - Telescope optical device according to claim 1,

characterized :

in that, for its folding, the concave membranous actuating membrane is deformed by the formation of concentric circular ondulations obtained by a succession of centered distorsions alternately concave and convex, altering the pure concave surface of the actuating membrane in a circular surface comprising a series of circular centered wawes whose the vertical crest to crest distance is so small as one wishes, in view of the number of waves so great as one wishes.

and in that the thin almost flat object so obtained is wound onto itself, forming a cylinder.

- IV - AMENDED DRAWINGS
Under 37 CFR 1.121 (d)

NEW SHEET 1/2

On immediate anterior figure 1,

a) cancelation of the flanges

b)cancelation of back to back membranes

c) correction of the indices mistakes

Cancelation of the figures 2, 3, 4, 5, 6, 7

Change of indices

Addition in figure 1 of the former coils 72 (see former figure 1) and former dipole 142 (see former figure 43), generating magnetic field

Insertion of the former figure 35 showing the actuating membrane, with active indices.

NEW SHEET 2/2

Addition of a figure 6 showing a very thin flat folding in the form of a narrow line.

This very thin folding is the limit of the alternately concave-convex distorsions of a concave membrane.

- V - CLAIMS LISTING

Original filed claims

Translation of published PCT text WO 96/10207

Amanded on November 04, 1999

CLAIMS

1) ~~Space telescope comprising~~:

a) ~~a first storey~~ containing a membranous mirror and said mirror actuating ~~and protecting~~devices~~;~~

~~b) a second storey located at the focal plane of the mirror and containing means for observing the image;~~

~~c) a third storey located at the curvature center of the mirror, and containing means to explore the shape of the mirror;~~

~~d) a accessory light device lighting the object scrutenized by the optical system;~~

~~e) a means to render jointly the three storey and the accessory light device,~~

characterized in that:

f) the mirror and its actuating device are ~~constituted by concentric membranes, free at their peripheries and tied by their central parts, directly or by an intermediate device~~;

~~g) the membranes, or only the actuating membrane, have surface devices, conductors, insulators, and semi conductors, separed, contiguous or stacked, constituting integrated circuits, and surface electrodes, having particulaaarly coils shape.~~

2) (canceled) Telescope according to the claim 1, characterized in that a winding centered on the optical axis of the telescope surrounds the means of uniting the three storeys at the level of the mirror storey, and/or where a wiring or a magnet with axis on same optical axis are tied to the mirror storey of said telescope.

3) (cabceled) Telescope according the claim 1, characterized in that the means tying the storeys is a blind cylinder (2) rigidified by tubes under pressure and by polymerization of a resin impregnating the said cylinder and tubes.

4) (canceled) Telescope according to claim 1, characterized in that the blind cylinder (2) tying the three telescope storeys together is placed in a protecting jacket (3).

5) (canceled) Telescope according the claim 1, characterized in that the blind cylinder (2) and the protecting jacket (3) are first folded by telescopic invagination then by folding spokes wise and scrolled along radiuses.

6) (canceled) Telescope according the claim 1, characterized in that the closed tubes associated by links to jacket (3) or to blind cylinder (2) of the telescope are folded by telescopic invagination at the same time as cylinder (2) or jacket (3), and have apertures through wich a pressurized gas can be introduced to provoke their extension.

7) (canceled) Telescope according to claim 1, characterized in that the blind culinder (2) of the telescope (1) and the protecting jacket (3) are slightly conical or bi-conical.

8) (canceled) Telescope according to claim 1, characterized in that windings symmetrically centered on the optical axis of the telescop (1) are fixed on the blind cylinder (2) at the level of the mirror storey.

9) (canceled) Telescope according to claim 1, characterized in that the means of folding are made of linear vertical elements associated by pairs, vertically mobile from an upper position to a low position, and integral of radial displacement means, moving continuously from a position far from the centre to a position closed to the centre.

10) (canceled) Telescope according to claim 1, characterized in that the means recognising the shape of the mirror, situated at the control stage and defining the optical axis of the mirror, moves inside a circle centred on the optical axis of the telescope, and perpendicularly to this axis.

11) (canceled) Telescope according to claim 1, characterized in that the means adjusting the mirror and its actuating membrane are gimbal or ball-joint mounted, and provided with actuators.

12) (canceled) Telescope according to claim 1, characterized in that the means controlling the mirror modify continuously the generating line of the mirror, while maintening the shape of revolution of the mirror, in such a manner that at each instant exist a circle of minimum aberration centred on the optical axis and moving from the optical axis towards the outside or vice versa.

13) (canceled) Telescope according to claim 1, characterized in that one or several photo-electric matrices scan the circle of minimum aberration.

14) Telescope according to claim 1, characterized in that the mirror and its actuating membrane are made totally or partially of a material having shape memory.

15) Telescope according to claim 1, characterized in that, for their folding, the mirror and its actuating membrane are made quasi flat by a succession of centred distorsions, alternatately concave and convex.

16) (canceled) Telescope according to caim 1, characterized in that the means which unit the several storeys is a tripode pyramidal frame the

triangular base of which is contained within a circle distinctly smaller than the mirror.

17) (canceled) Telescope according to claim 1, characterized in that the frame is made from flexible tubes having a complex annular structure comprising, going from the outside to the inside :

a) a textile layer for absorbing the solar radiation,

b) an insulating layer,

c) a textile layer impregnated with a resin curing under temperature or under the effect of a gas,

d) an axothermic coating reacting under effect of a gas.

18) (amended) Telescope according to claim 1, characterized in that the membranes constituting the mirror and the actuating mmebrane are obtained by <depositing a substance> on a liquide contained in a <vertical> container roteting around <its> vertical axis.

19) (amended) Telescope according to claim 1, characterized in that the membranes have peripheral and/or central flanges <shaped on the walls of the container>.

20) (canceled) Telescope according to claim 1, characterized in that electrodes centered on the axis of rotation of the container create an electric fild distorting the shape of the surface of the rotating liquide.

21) (canceled) Telescope according to claim 1, characterized in that a ferroelectric substance exist in the bottom of the container.

22) (canceled) Telescope according to claim 1, characterized in that an accessory light device is located on the optical axis of the system, at the level of mirror storey.

23) (canceled) Telescope according to claim 1, characterized in that a second convec semi transparent parabolic mirror the axis of which is the same as the axis of main mirror, the convex part of which is oriented towards the main mirror, and its virtual focus confounded with the real focus of the main mirror.

24) (canceled) Telescope according to claim 1, characterized in that the secondary mirror is made from a parallel faces parabolic diopter the convex face of which is a semi-reflecting coating.

25) (canceled) Telescope according to claim 1, characterized in that a third parabolic mirror, the axis of which is the same as the optical axis of the main mirror, the convex part of which is oriented towards this main mirror, has its focal point confounded with the one of said main mirror, or very slightly more distant from this said main mirror.

26) (canceled) Telescope according to claim , characterized in that the means receiving the image formed by the main mirror is a CCD transparent or semi transparent matrix able to receive on its back a luminous signal

27) (canceled) Telescope according to claim 1 and 26, characterized in that a second CCD matrix is put on the back of the first, when this is opaque.

28) (canceled) Telescope according to claim 1, characterized in that one spherical concave mirror is tied to one of the storey, and in that the curvature center of this mirror is located in another storey.

29) (canceled) Telescope according the claims 1 and 28, characterized in that there are two or several mirrors of the claims 28, symmetrically located around the optical axis of the space optique system.

30) (canceled) Telescope according to claim 30 characterized in that a cut band filter protects the image-receiving photo-electric matrix from the laser beam crossed the secondary semi-transparent mirror.

31) (canceled) Telescope according the claims 1 and 23 characterized in that the centre of the secondary mirror is totally reflecting onto a surface which is the projection of the surface of the photo-electric image-receiving matrix on the surface of the mirror.

32) (canceled) Telescope according the claim1 characterized in that a large size circular screen, perpendicular to the optical axis of the telescope, and centered on this axis, is located beyond or on the side of the sagittal analyser, and in the later case has in its centre an annular hole of the same size as the said sagittal analyser.

33) (canceled) Telescope according to the claim 1, characterized in that a photo-electric matrix, preferably a portion of a concave sphere, is placed slightly beyond the theortical sagittal segment of the main mirror, centred on the theoritical optical axis of the telescope, its concave side turned towards the sagittal segment, and its centre of curvature being preferably at the middle of the sagittal segment.

34) (canceled) Telescope according to claim 1, characterized in that a movable opaque screen perpendicular to the optical axis of the telescope, having in its central portion a hole situated on this optical axis, and moving in parallel with said optical axis in shch a way that the central hole scans the sagittal segment.

35) (canceled) Telescope according to claims 1 and 28 characterized in that the face of the screen turned towards the main mirror is covered with a photo-electric matrix.

36) (canceled) Telescope according to claims 1 and 28 characterized in that the movable screen is replaced by several stacked polarized cells, all of them

having in their center an inactive zone, theses celles being successivly activated in such a way as to simulate the displacement of the screen.

37) (canceled) Telescope according to claims 1 and 25 characterized in that the spherical matrix has a central hole in which is placed a cylinder the axis of which is the same as the optical axis, and which is mobile along this axis, and having at the end which is turned towards the sagittal segment, a photo-electric matrix.

38) (canceled) Telescope according to claim 1, characterized in that, in the case of an open frame, protecting parabolic membrane, constituted of resin impregnated fibers, having peripherical flanges exceeding flanges of the actuating membrane and mirror, are located beyond the said actuating membrane.

39) (canceled) Telescope according to claim 1, characterized in that hearth bound telescope mirror is free at its periphery and electrically connect at a rigid support by its cebntral flange.

40) (cabceled) Telescope according to claims 1 and 41, characterized in that the actuating membrane is applied onto the surface of a rigid support, or constitute the superficial layer of this rigid support.

41) (canceled) Telescope according to claims 1 and 41, characterized in that tannular covers fitted whith inside surface devices electrically linked with the rigid support, are laid onto the centre and periphery of said rigid support, said covers covering the periphery and the centre of the mirror.

42) (canceled) Telescope according to claims 1 and 41, characterized in that a cylindrical jacket, made of sounproofing materials, closed at its upper end by an optical membrane that close it.

43) (canceled) Telescope according to claim 1, characterized in that the enveloppe and the jacket are made of two separated elements, the upper cylindrical element, open and comprising the focal storey and the centre of curvature storey, and the lower cylindrical element, closed at one end and comprising the mirror storey.

11/04/99 Amendments CLAIMS (TE991015)
Working document

1 (amended). Optical device comprising a mirror and a device actuating the mirror, characterized in that the mirror and the actuating device are independent concave membranes (called membranous mirror and actuating membrane).

14 (amended) Optical device according to claim 1 characterized in that the actuating membrane and the membranous mirror are made totally or partially of a material having shape memory.

15 (amended)- Optical device according to claim 1 characterized in that, for their folding, the concave actuating membrane and the concave membranous mirror are made quasi plane by the formation of concentric circular undulations obtained by a succession of centred distorsion alternately concave and convex, and the quasi plane one thus obtained rolled up on itself according to a diameter.

18 (amended)- Optical device according to claim 1 characterized in that the actuating membrane and the membranous mirror are obtained by material deposit on a liquid contained in a container rotating around a vertical axis.

19 (amended)- Optical device according to claim 1 characterized in that the membranous mirror and the actuating membrane have central and/or peripheral flanges

44 (new)- Optical device according to claim 1 characterized in that the distance between the actuating membrane and the membranous mirror is monitored permanently by capacitive coupling between said actuating membrane and said membranous mirror.

11/04/99 CLAIMS (TE991015)

1 (amended). Optical device comprising a mirror and a device actuating the mirror,

characterized in that the mirror and the actuating device are independent concave membranes (called membranous mirror and actuating membrane).

14 (amended)- Optical device according to claim 1 characterized in that the actuating membrane and the membranous mirror are made totally or partially of a material having shape memory.

15 (amended)- Optical device according to claim 1 characterized in that, for their folding, the concave actuating membrane and the concave membranous mirror are made quasi plane by the formation of concentric circular undulations obtained by a succession of centred distorsion alternately concave and convex, and the quasi plane one thus obtained rolled up on itself according to a diameter.

18 (amended)- Optical device according to claim 1 characterized in that the actuating membrane and the membranous mirror are obtained by material deposit on a liquid contained in a container rotating around a vertical axis.

19 (amended)- Optical device according to claim 1 characterized in that the membranous mirror and the actuating membrane have central and/or peripheral flanges

44 (new)- Optical device according to claim 1 characterized in that the distance between the actuating membrane and the membranous mirror is monitored permanently by capacitive coupling between said actuating membrane and said membranous mirror.

07/12/06 Amendments CLAIMS (TE20060526)
Working document

1 (twice amended)- Telescope optical device comprising a <u>concave</u> mirror and a device actuating the mirror,

characterized in that the mirror and the actuating device are ~~independent~~ ~~concave~~ <u>free</u> membranes ~~(called membranous mirror and actuating membrane)~~ <u>without contact between them, or with other device.</u> ~~free at their peripheries~~ <u>and tied by their central parts to the telescope</u>..

14 (canceled)- Optical device according to claim 1 characterized in that the actuating membrane and the membranous mirror are made totally or partially of a material having shape memory

18 (canceled)- Optical device according to claim 1 characterized in that the actuating membrane and the membranous mirror are obtained by material deposit on a liquid contained in a container rotating around a vertical axis.

19 (canceled)- Optical device according to claim 1 characterized in that the membranous mirror and the actuating membrane have central and/or peripheral flanges

44 (canceled)- Optical device according to claim 1 characterized in that the distance between the actuating membrane and the membranous mirror is monitored permanently by capacitive coupling between said actuating membrane and said membranous mirror.

45 (new) - Telescope optical device according to claim 1,
characterized in that there are two levels of control to give at the free membranous mirror a perfect shape :

In a first level, an aproximate shape is given to the free actuating membrane by interaction of a magnetic fiels tied to the telescope with magnetic fields generated by actuating membrane;

in a second level, a perfect form is given to the free membranous mirror by electrostatic interaction of the free actuating membrane with the free membranous mirror.

46 (new) – Telescope optical device according to claim 1,

characterized in that by use of the capacitive coupling between the conductive layer of the mirror and specific electrodes of the actuating membrane, the spread electronic integrated in the actuating membrane acts for the self-stabilisation of the shape of the system mirror--actuating membrane

47 (new - 15 twice amended) - Optical device according to claim 1 characterized in that, ~~for their folding, the concave actuating membrane and the concave membranous mirror are made quasi-plane by the formation of concentric circular undulations obtained by a succession of centred distorsion alternately concave and convex, and the quasi plane one thus obtained rolled up on itself according to a diameter>~~ for its folding, the concave membranous mirror is deformed by the formation of concentric circular ondulations obtained by a succession of centered distorsions alternately concave and convex, altering the pure concave surface of the membraneous mirror in a circular surface comprising a series of circular centered wawes whose the vertical crest to crest distance is so small as one wishes, in view of the number of waves so great as one wishes.

and in that the thin almost flat object so obtained is wound onto itself, forming a cylinder.

48 (new - 15 three amended) Optical device according to claim 1 characterized in that, ~~for their folding, the concave actuating membrane and the concave membranous mirror are made quasi plane by the formation of concentric circular undulations obtained by a succession of centred distorsion alternately concave and convex, and the quasi plane one thus obtained rolled up on itself according to a diameter~~ for its folding, the concave membranous actuating membrane is deformed by the formation of concentric circular ondulations obtained by a succession of centered distorsions alternately concave and convex, altering the pure concave surface of the membraneous mirror in a circular surface comprising a series of circular centered wawes whose the vertical crest to crest distance is so small as one wishes, in view of the number of waves so great as one wishes.

and in that the thin almost flat object so obtained is wound onto itself, forming a cylinder.

07/12/06 CLAIMS (TE20060526)

1 (twice amended)- Telescope optical device comprising a mirror and a device actuating the mirror,

characterized in that the mirror and the actuating device are free concave membranes without contact between them, or with other device, and tied by their central parts to the telescope..

45 (new) - Telescope optical device according to claim 1,

characterized in that there are two levels of control to give at the free membranous mirror a perfect shape :

In a first level, an aproximate shape is given to the free actuating membrane by interaction of a magnetic field tied to the telescope with magnetic fields generated by actuating membrane;

in a second level, a perfect form is given to the free membranous mirror by electrostatic interaction of the free actuating membrane with the free membranous mirror.

46 (new) - Telescope optical device according to claim 1,

characterized in that by use of the capacitive coupling between the conductive layer of the mirror and specific electrodes of the actuating membrane, the spread electronic integrated in the actuating membrane acts for the self-stabilisation of the shape of the system mirror--actuating membrane.

47 (new - 15 third amended) - Optical device according to claim 1,

characterized in that, for its folding, the concave membranous mirror is deformed by the formation of concentric circular ondulations obtained by a succession of centered distorsions alternately concave and convex, altering the pure concave surface of the membraneous mirror in a circular surface comprising a series of circular centered wawes whose the vertical crest to crest distance is so small as one wishes, in view of the number of waves so great as one wishes.

and in that the thin almost flat object so obtained is wound onto itself, forming a cylinder.

48 (new - 15 third amended) Optical device according to claim 1,

characterized in that, for its folding, the concave membranous actuating membrane is deformed by the formation of concentric circular ondulations obtained by a succession of centered distorsions alternately concave and convex, altering the pure concave surface of the actuating membrane in a circular surface comprising a series of circular centered wawes whose the vertical crest to crest distance is so small as one wishes, in view of the number of waves so great as one wishes.

and in that the thin almost flat object so obtained is wound onto itself, forming a cylinder.

- VI - WORKING DOCUMENTS FOR SUBSTITUTE SPECIFICATION under 37 CFR 1.121 (b)(3) and 1.125 (b) (c) showing absence of new matter

Each paragraph of the substitute specification is put in connection with relevent paragraphs or lines of the immediate prior version (TE20010528c) filed on June 28, 2001, or of the original filed claims (TE980131), translation of the international published PCT text WO 96/10207.

The ambiguity of the adjective " independent " **highlighted by the Examiner** in claim 1, compels the Applicant to reinstate original filed text.

In the mind of the Applicant, an "independent " membrane is a membrane without material contact with other object, in particular with an other membrane.

Immediate prior version (TE20010528c)

IMPROVED TELESCOPE

FIELD OF THE INVENTION

The invention concernes the space telescopes and large membraneous mirrors.

STATE OF THE FORMER ART

PERKINS and ROHRINGER (US 4 093 351), LE GRILL (Fr 2 662 512), and many other authors describe membranous mirrors tied to a peripheral rigid structure and stiffened and shaped by means of electric charges.

SILVERBERG, (WO 94/10721), describes a double flag membranous mirror, stiffened by surface charges, and shaped by outside fields created by a rigid support.

~~BUI HAI et NHU (US 5 182 512) describes, for use in ultra hight frequency, a mirror obtained by curing a rotating resin.~~

LENINGRAD PREC MECH OPTI, (SU 1615 655 A) describes a monolithic mirror self shapable made up of two piezoelectric thin plates closely in contact on their whole surface, this mirror being curved overall by a single electrode acting on one of the plates, and locally by discrete electrodes acting on the other plate.

ANDREAS THEODORO AUGOUSTI (GB 2 247 323 A) describes a monolithic mirror self shapable made up of a deformable substrate covered on a face by a reflective surface and on the other face by a network of electrical conductors, the whole being located in a magnetic field with which the currents circulating in the conductors react.

In these two last mirrors the electrodes or conductors in contact with the reflective surface oblige to a high thickness and/or a high rigidity to minimize the surface defects induced by these electrodes or conductors

generative of electric and thermal constraints.

None the preceding authors describes or evokes the folding of the mirrors.

HUTCHINSON et all (US Patent N° 5,237,337) describe the folding of a concave metallic membrane on a mendrel, but this folding seems be out of the topological rules.

GOAL OF THE INVENTION

The goal of the invention is to remove the defects of the former art, in particular the necessity of a heavy frame, and the inability to fold purely concave membranous mirror.

SUMMARY OF THE INVENTION

~~Space telescope comprising at least a membraneous mirror 1 and a actuating membrane 2 for shaping mirror 1.~~

Macro and micro control. The space telescope according to the invention comprises at least a membraneous mirror 1, an actuating membrane 2 for micro shape by mainly electrostatic action the mirror 1, and a magnetic field tied to the telescope for macro shape the actuating membrane 2 by electromagnetic action.

These two levels of shape control allow to avoid the disavantages of ANDREAS THEODORO AUGOUSTI

Parabolic free and without contact membranes

The mirror 1 and the actuating membrane 2 are free to their peripheries and are tied to the telescope by means of their central parts, either directly or by means of a device.

They do not have material contact between them, exept possible common contact in central part with the telescope

Magnetic dipole for macro control A magnetic dipole centered on the optical axis and tied to the telescope generate a magnetic field axed on this optical axis and interacting with magnetic field of centered or discret coils of the actuating membrane.

~~**Parabolic membranes.** The membraneous mirror 1 and the actuating membrane 2, are made by spreading a liquid film 3 which hardens on the surface of a liquid 4 contained in a circular container 5 rotating around a vertical axis.~~

~~The mirror 1 and the actuating membrane 2 are tied together by means of their centrales flanges 2.1 or 2.2, either directly or by means of a cylinder 6.~~

~~**Magnetic dipole.** A magnetic dipole parallel to the optical axis is rigidly tied to the telescope.~~

~~If one electrode is implemented by a spiral shaped surface design, it works by electrostatic effect when no current flows, and by magnetic effect when a current is present.~~

BRIEF DESCRIPTION OF THE FIGURES

~~Fig. 1 – Mirror 1 and actuating membrane 2~~

~~Fig. 2, 3 – Membrane 2 on rotating liquid.~~

~~Fig. 4, 5 – Ring and handle for handling of the membrane 2.~~

~~Fig. 6 – Membrane with downward flanges.~~

~~Fig. 7 - Membrane with upward flanges.~~

~~Fig. 8, 9, 10 – Folding of the mirror~~

Fig 1 - Mirror 1 with actuating membrane 2 and magnetic dipoles 4 and 5.

Fig 2 - Actuating membrane 2 with electrodes

Fig 3, 4, 5, 6 - Folding of the mirror.

LIST OF THE ITEMS

1 - Membranous mirror

2 - Actuating membrane

3 - Peripheric coil inducing magnetic field

4 - Central device inducting magnetic field

5 - Circular centered electrode acting upon curvature of the actuating membrane 2

6 - Circular local electrodes having local effet on actuating membrane 2

7 - Conducting surface of the mirror 1

8 - Specific electrodes of the actuating membrane 2 acting the mirror 1

DETAILED DESCRIPTION

~~**Mirror and actuating membrane.**~~

~~**First preferred implementation** (Fig. 2).~~

~~On takes a liquid 4 in an horizontal container 5 rotating smoothly around a vertical axis. Then, a small amount of another liquid 3 is poured over it all the way to the edge 5.1 of container 5.~~

~~This new liquid will wet the edge 5.1 and will solidify by spontaneous or induced curing thereby creating a membrane 2.~~

~~**Second preferred implementation.** It differs from the one before in that the liquid 3 contains a dissolved product which, after evaporation of the liquid 3, will leave a film onto the underlying liquid.~~

~~In a variant case, liquid 3 also contains suspended fibers.~~

~~**Third preferred implementation** (Fig. 2). In this case, the liquid 3 only contains suspended fibers which, after evaporation, will create a fibrous layer susceptible to receive a resin that can be cured.~~

~~A smoothing layer is superimposed on the composite layer so that the roughness of this composite layer does not showing at the surface of the smoothing layer, or be smaller as a pre set value.~~

~~**Fourth preferred implementation.** It differs from the first in that the liquid 3 is obtained by simultaneous or consecutive addition of two different liquids.~~

~~**Fifth preferred implementation**. Liquid 3 is absent, and the membrane 2 is created by a liquid or a gaz that solidifies directly onto the surface of the main liquid 4.~~

~~**Reflecting layer**. A reflecting medium is put on the membrane while it is still on the rotating liquid 4, namely by the stacking layers having appropriate dielectric indices and appropriate thicknesses.~~

~~**Surface designs**. While it is still on main liquid 4, the membrane 2 is locally covered, by means in accordance with the former art, with a conducting covering in the shape of surface designs 7, in so doing creating a number of annular electrodes centered on the optical axis, acting upon the radius of curvature, and a number of local electrodes acting upon local defects.~~

I - MIRROR, ACTUATING MEMBRANE, AND MAGNETIC DIPOLES

It is obvious that, when the membranous mirror 1 and the actuating membrane 2 will be unfolded in space, they do not will take back spontaneously their original perfect parabolic shapes

Magnetic field tied to the telescope

Telescope is fitted at its bottom, at the level of the mirror, with device generating magnetic field centered on the axis ot this telescope.

A circular coil made of conducting element, axed on the optical axis of the telescope, when activated by an electric current, generates a magnetic field axed to the axis of the telescope.

The magnetic field can be generated by a coil 3 of diameter egal or biger than the membranes, or by a coil or magnet 4 internal to the central holes of the membranes.

This magnetic field of the dipoles 3 or 4 interacts with the magnetic field genered by electrodes implemented on the actuating membrane, allowing a macro control of the shape of this actuating membrane.

Mirror and actuating membrane.

Surface circular electrodes on actuating membrane. The membrane 2 is locally covered, by means in accordance with the former art, with a number of annular conductive electrodes 5 centered on the optical axis, and a number of local anular conductive electrodes 6.

Actuating coils..

When they are feeded by electric current, discrete coils 5 and 6 of the actuating membrane 2 generate magnetic fields interacting with the magnetic field of the the telescope, so as to maintain the desired shape of said membrane and to keep it centered on the optical axis of the telescope.

The centered coils 5 generate an axial magnetic field acting on the radius of courvature of the actuating membrane 2, and the local coils 6 generate local magnetic fields having local actions

The actions of coils 5 and 6 give an approximate parabolic shape to the actuating membrane 2 fitted with these coils 5 and 6.

The final perfect parabolic shape is given to the mirror membrane 1 by the electrostatic forces existing between the conducting surface 7 of the mirror membrane and electrodes 8 present on actuating membrane 2.

Electronic spread in the membrane. Stabilisation of system constituted by mirror 1 and actuating membrane 2.. The actuating membrane 2~~, while still on liquid 4,~~ is locally covered, by means of the former art, with a thin structure identical to that of an integrated multilayer circuit having conducting, insulating or semi conducting elements, contiguous or superimposed.

Electrical supply of these surfaces designs is provided by surface conductors linked to a power supply through the center of the membrane.

These surface designs IC, when integrated to the actuating membrane of the mirror, allows, according to the invention, through the use of a capacitive coupling between electrodes 8 of the actuating membrane 2 and the metallic layer 7 of the mirror ~~membrane and the mirror~~, a self control of the distance between mirror and membrane, and consequently the stabilization of the shape of the membranes without the intervention of the central system.

~~**Actuating coils.** Telescope is fitted at its bottom, at the level of the mirror, with a coil made of conducting elements.~~

~~The coil so created generates, when activated by an electric current, a magnetic field parallel to the axis of the telescope.~~

~~Discrete coils 7 of the actuating membrane will interact with this magnetic field, so as to maintain the desired shape of said membrane and to keep it centered on the optical axis of the telescope.~~

~~The membrane 2 fitted with coils 7 has only an approximate shape, and the final shape is given to the mirror membrane 1 by the electrostatic forces existing between the conducting surface 8 of the mirror membrane and electrodes 9 present on membrane 2.~~

~~**Mirror control.** Surface electronic circuits integrated to the membrane during manufacturing, control the potentials of the electrodes acting upon the mirror, as well as the magnetic field of the membrane coils and the magnetic field of the telescope.~~

~~The metallised surface 8 of the mirror 1, or any conducting surface, should the reflective surface be d~~ielectric, will initially be at 0 potential~~.~~

~~Electrodes 9 of actuating membrane 2 are set at positive or negative potentials, and as a result, decrease or increase the relative distance between mirror and actuating membrane.~~

~~In this manner, important local distorsion of the actuating membrane 2 will not prevent getting a perfect shape for the mirror.~~

Macro and micro controls. The system, according to the invention, separates long range action acting on the actuating membrane through the telescope magnetic field interacting with the fields generated by current flowing in electrodes 5 or 6 of the actuating membrane, and short range action acting through electric fields between metallic layer 7 of the membranous mirror and electrodes 8 of the actuating membrane.

~~**Macro and micro controls.** The system, according to claim, separates long range action acting on the actuating membrane through magnetic fields interacting with the field of the coil, and short range action acting through electric field between membranes.~~

~~**Rotating container.**~~

~~**First preferred implementation** (Fig. 4 and 5). The edge 5.1 of a circular rotating container 5 is surmounted and in contact with a ring 10 having handling means 11, such as handles allowing this ring to be grabbed and taken away from the edge.~~

~~The membrane 2 created when the film 3 solidifies, will stick the ring 10 thereby allowing this handling.~~

~~**Second preferred implementation** (Fig. 6). The outside wall 5.2 of the container is a surface of revolution.~~

~~The membrane 2 extends, by means of former art, with equal or greater thickness, on the outside wall 5.2 of the container, previously coated with a non-sticking product, and in so doing creating a peripherical flange 2.3 that increases the stiffness of this periphery, thereby allowing it to recover better and faster its original shape.~~

~~It ends with a thicker band allowing handling.~~

~~In a variation (Fig. 7), the membrane extends on the inside wall of the container in the shape of a flange 2.4 higher than the rotating liquid.~~

~~**Third preferred implementation** (Fig. 6). The container 5 has a central circular hole 5.3 limited by a wall 5.4 holding the liquid.~~

~~The external surface 5.5 of wall 5.4 (facing the axis) has the shape of a cylindrical or conical surface of revolution.~~

~~The membrane 2 is extended, with increased thickness, on the external surface 5.5, in so doing creating an annular central flange 2.1.~~

~~**Fourth preferred implementation**. In a variation, the membrane is extended, by a flange 2.2, in the inside surface of the wall of the container and therefore raised above the rotating liquid.~~

~~Two examples of arrengement (fig. 43) show parallel membranes and back to back membranes.~~

II - MIRROR AND MEMBRANE FOLDING (Fig. 4, 5, 6, 7) ~~Mirror and membrane folding (Fig. 8, 9, 10)~~. The mirror 1 and the actuating membrane 2 are made totally or in part of a material with shape memory.

After manufacturing, the mirror 1 and the membrane 2 are distorted in such a way that this distorsion is retained until new conditions appear, that brings back the initial shape.

The membranes are concave; if one pushes (Fig. 8) the bottom of the concavity, at its center and perpendicularly to the tangent plane, it results a symmetrical circular distorsion which will intrude into the concavity.

Examination of this previously concave surface then reveals a concave peripheral ring and a central convex surface.

This central convex surface is equally pushed in the same conditions as before, and a new element of concave centered surface can be seen.

Pursuing with the creation of alternately concave and convex surfaces, one obtains a surface resembling a series of circular, centered waves (Fig. 8, 9, 10).

The thickness of this folding, that is the vertical crest to crest distance, can be small as one wishes. It only requires an increase in the number of waves.

For example, the figure 6 shows a cut in a concave membrane of any diameter, with a great number of waves.

For practical drawing reasons, in particular for scale, the waves are invisible, and this cut is shown by a narrow line, however large is the concave membrane.

Once these waves fixed according to proper physical conditions, the almost flat object so obtained can be ~~scrolled lengthwise~~ wound onto itself, as a flat paper circular disk..